

# Transformation Labs as a Sustainability Intervention to Leverage the Human Factor of Social-Ecological Change in the Escalante Community Garden

Author: Marley Halter  
Chair: David Manuel-Navarrete  
Committee: Scott Cloutier  
Hallie Eakin

## Abstract

While we often see community gardens as material spaces managed by organizations, resources and institutional arrangements do not fully define a community garden or ensure its success. Understanding the “human factor” is key to implementing interventions at the subjective level that allow gardens to thrive. The Escalante Community Garden in Tempe, Arizona is a transforming social-ecological system wherein volunteers exhibiting collective efficacy are a crucial component. To keep this undergoing transformation on a positive pathway, I leveraged a sustainability intervention, a transformation lab, using a set of replicable participatory tools to support personal and interpersonal dynamics beyond an organizational perspective. Results suggest that the transformation lab process fostered self-reflection and collective agency, developing and strengthening the garden’s human factor.

## Introduction

Community gardens often fail despite all the potential benefits for cities and people (American Community Gardening Association, 1998; Lawson & Drake, 2013). One identified cause of failure is the misalignment between the gardens’ formal organization, and the needs and desires of the community (Bleasdale, Crouch, & Harlan, 2011). Another is the “tragedy-of-the-commons” mentality where many people harvest communal garden spaces, while the difficult chores and responsibilities fall to a precious few dedicated, often resentful, community members (Charles, 2012). I propose that failing to cultivate meaningful interpersonal relations that create collective agency between garden volunteers is another key, although less explored, reason for failure. Yet, collective agency is precisely the focus of social innovation labs, and some organizational theories such as Peter Senge’s “Learning Organization” and Otto Scharmer’s “Theory U” (Hassan, 2014; Mezirow, 2000; Senge, 1990; Scharmer, 2016).

A deliberate process to build collective agency organized as a transformation lab (t-lab) could be instrumental in building stronger and more successful interpersonal relations in the garden volunteer community. T-labs have been proposed by the STEPS (Social, Technological and Environmental Pathways to Sustainability) Center at the University of Sussex to promote

transformations by changing the way in which people relate to the social-ecological systems of which they are part (STEPS Centre, 2016). I frame community gardens as social-ecological systems, undergoing (transformational) change. This framing allows us to view the garden community as a complex system made up of several factors, including the material factor, the organizational factor, and the critical, but often unaddressed, human factor. I chose the term “factor”—as opposed to “subsystem” or “component”—because of the integrated, dependent, and dynamic nature of the term. The organizational factor represents the governance system, or the organizations and structures who make the rules and enforce them within a social-ecological system. The material factor represents the physical boundaries and resources that make up the material aspects of a system. The phrase “human factor” is used in sustainability and psychology literature to describe the unpredictability of human interactions with and within systems, as well as framing the use of human and social capital in community development (Luthans & Youssef, 2004; Luthans et al, 2004; Pfeffer, 2010). Social capital (i.e. the sense of community, sense of place, social networks, trust and reciprocity) is a key element to community garden volunteering that can affect participants’ level of participation and engagement (Kingsley & Townsend, 2006). When we view the garden through the lens of all three factors (material, organizational, and human), we can tailor interventions to target multiple leveraging points in the system simultaneously and facilitate long-term garden success. Furthermore, the link between individual/collective agency and community garden success is under-researched (Glover, 2004). T-labs are proposed as a method to explore this link, as well as address the need for more “rigorous, evaluative studies of community garden interventions” (Draper & Freedman, 2010, p. 488).

I build on literature on deliberate transformative processes (e.g., O’Brien, 2012; O’Brien, 2015) to explore imaginative and creative tools and solutions that are beyond the scope of conventional participatory deliberative processes (Van der Walt et al, 2009; Gryszkiewicz et al, 2016). Activities that could smooth the way for the creation of these solutions in a t-lab include arts-based community building and trust building activities that urge participants to be vulnerable and embrace the uncertainty inherent in transformative change. By looking at community gardens as social-ecological systems, this study pulls away from the typical view of community gardens as organizations and argues that community garden research can instead contribute to literature on deliberate transformation of social-ecological systems (O’Brien 2012; Manuel-Navarrete & Pelling 2015).

This paper reports on a t-lab experiment conducted by the author in Escalante Community Garden (ECG) in Tempe, Arizona. This community garden has existed for six years, and it faces problems that are typical of community gardens elsewhere, such as volunteer retention, insecure land tenure, data management, funding, and cohesive leadership (Guitart, Pickering, & Byrne, 2012). Yet this community garden in particular is rich in institutional support and material resources thanks to support from the City of Tempe and from donors through the

Tempe Community Action Agency (TCAA). It became evident that despite abundant resources in the material and organizational factors, the garden volunteer community still faces significant challenges within the human factor of my social-ecological system framework (Figure 1). Preliminary fieldwork included volunteering in the garden and building interpersonal relationships with the garden volunteer community. My time spent in the community revealed a distinction between two types of volunteers, what I came to call the “core” and the “periphery”, based on the volunteers’ level of personal commitment to the garden. Core volunteers show higher levels of personal commitment to both the garden’s physical space (based on the amount of time spent at the garden) and to the social community (based on the amount of responsibility they assume). These observations (discussed in more detail later in the paper) resulted in a series of research questions which drove this research:

RQ 1. Can volunteers be classified as either “core” or “peripheral” volunteers based on their level of commitment to the garden?

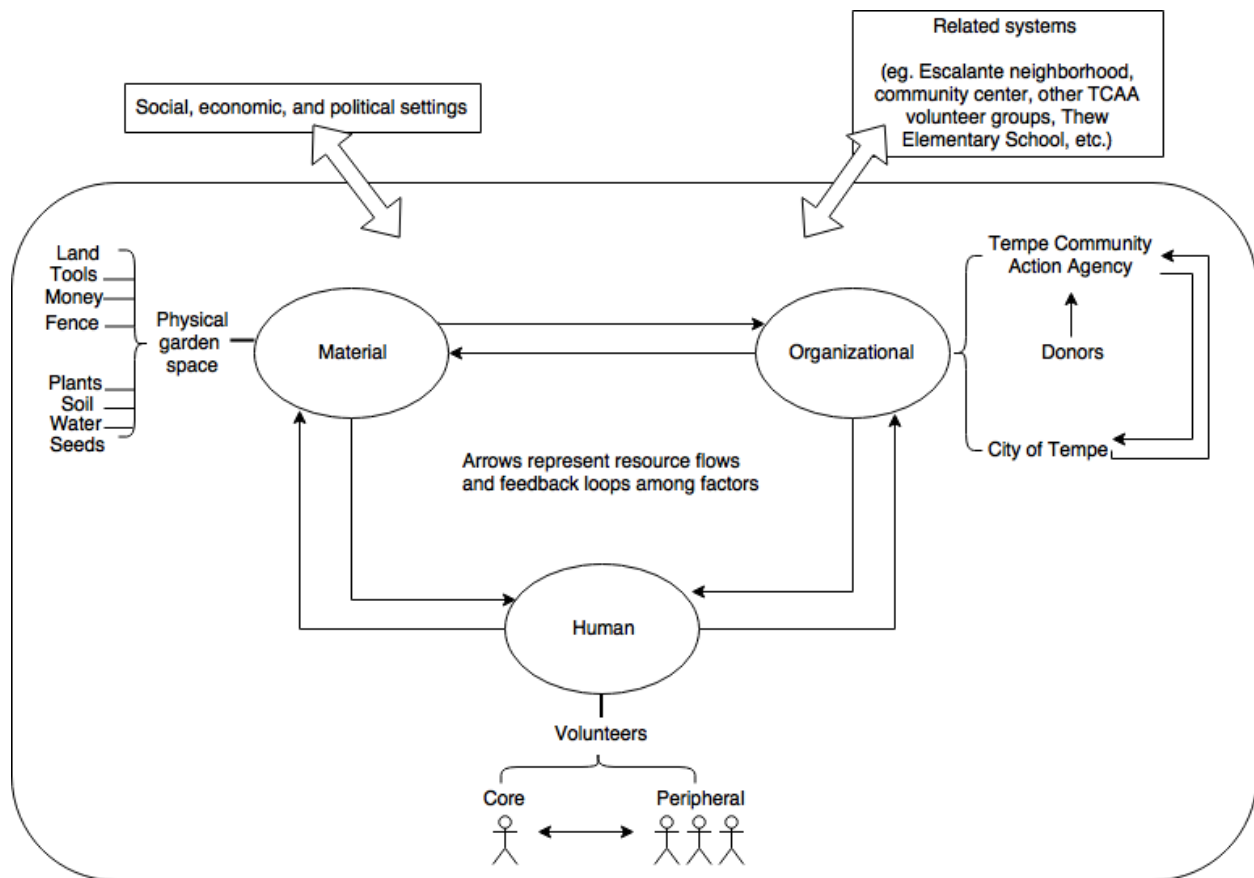
RQ 2. Can a t-lab contribute to movement across the two groups (specifically from periphery to core)?

RQ 3. Do core volunteers value different aspects of the garden than periphery volunteers and can value trends be drawn across the two groups?

RQ 4. Will participating in the t-lab change the way volunteers value the garden community?

After reviewing literature on social-ecological system thinking and transformation in community gardens, I overview community gardening in the Phoenix metropolitan area, with a particular focus on Tempe and the Escalante neighborhood. The methods and research design section presents the t-lab design and process implemented at Escalante. Results suggest that the t-lab process fostered self-reflection and collective agency, developing and strengthening the garden’s human factor. Finally, I discuss study limitations, potential for replication, and address some far-reaching results of t-lab interventions for not only this community garden but others as well.

Figure 1. Escalante Community Garden Social-Ecological System Framework



### Deliberate Transformation of Community Gardens as Social-Ecological Systems

Social-ecological systems (SES) are “composed of multiple subsystems and internal variables within these subsystems at multiple levels” that are interconnected and contain various positive and negative feedback loops among different levels of the system, ultimately affecting the behavior of the system as a whole (Ostrom, 2009). Because of their complexity and being in a state of constant change, SES are often plagued by seemingly impossible to solve problems—wicked problems—that are the focus of sustainability science. In recent years, some attention is directed to the subjective or human component of social-ecological organization (Manuel-Navarrete 2015, Stedman 2016). Human subjectivities are particularly important to understand intentional change in SES. O’Brien’s (2012) “deliberate transformation” defines transformation as one of many potential solutions to sustainability problems. Deliberate transformation does not happen *to* actors in a system, but rather manifests as pathways that actors can collectively promote or resist, potentially yielding unique solutions (O’Brien, 2012).

Community gardens, most simply defined as “open spaces which are managed and operated by members of the local community in which food or flowers are cultivated”, have rarely been studied as SESs (Guitart, Pickering, & Byrne, 2012, p. 364). When so, they are typically seen as components of the larger urban SES, and playing roles such as increasing resilience through the provision of ecosystem services or human and ecological health (Barthel,

Folke, & Colding, 2010; Cilliers, et al., 2017). In some instances, the social and ecological benefits of community gardens are addressed within a social-ecological systems framework; for example, King (2008) includes community gardens as one of several “alternative approaches to food production,” which the paper reviews “in relation to key concepts from ecological systems thinking” (King, 2008, p. 111). Most often, when researchers focus on human relationships within the context of a community garden, they take on an organizational perspective, particularly when addressing volunteer recruitment and retention (Barnes & Sharpe, 2009). Typically, community gardens are seen as part of a larger organization that works within the community, where volunteers act simply as an extension of a nonprofit or other organization (Twiss, et al., 2003; Chalker-Scott & Collman, 2006; Lanier, Schumacher, & Calvert, 2015). Even in some cases where community gardens are framed as “citizen-based”, there is no discussion of the social (or other) implications of the garden being run by volunteer community members as opposed to nonprofit or government organizations (Asah & Blahna, 2012; Asah, Lenentine, & Blahna, 2014). This is not always the case; for example, the work of Ghose and Pettygrove investigate issues of social transformation and agency through a case study of a citizen-based garden, similar in structure to the ECG, located in Milwaukee, Wisconsin (Ghose & Pettygrove, 2014). Because of the material resources required to maintain a garden (i.e. land, water, seeds and plants, gardening tools, fences, the money to buy these things, etc.) and because most, if not all, of the workers in such a garden are unpaid volunteers, most gardens need at least minimal organizational support that comes from a nonprofit, city program, private company, or similar entity (Armstrong, 2000).

Even with organizational support and abundant resources, gardens still fail regularly, and that is because one key aspect, the volunteers, is often neglected. Despite the noted lack of research into effective management of volunteer resources, there is a robust body of literature surrounding the current state of volunteer recruitment efforts (and to a lesser extent, volunteer retention efforts) on the institutional level, particularly in community sports organizations (Cuskelly, Taylor, Hoye, & Darcy, 2006; McBride & Lee, 2012). Because the ECG volunteer group is primarily self-organizing and managed on a grassroots level (with only minor support from the garden’s governing non-profit, TCAA), most of the volunteer retention practices that are addressed in this body of literature do not apply to the social system within the ECG. Likewise, much of the community development literature includes methods for building social capital and community cohesion through a “top-down” approach (Cloutier & Pfeiffer, 2015; Connelly, Markey, & Roseland, 2011). While both “top-down” and “bottom-up” mobilization are important for community garden sustainability and transformation, including volunteer retention (Isidiho & Sabran, 2016), the current social dynamics of the ECG led me to believe that focusing on a “bottom-up” approach would be most effective in this context.

The garden volunteers and their interpersonal relations and shared culture, i.e. the “human factor”, represents one facet of a complex, social-ecological system that makes up the

ECG. The fact that the system is “complex” means that it is fluid and constantly changing, yet simultaneously self-organized by the actions (both individual and collective) of the volunteers who work in the garden (Holling, 2001). The ECG SES is not static but currently undergoing a transformational change (as defined primarily by Manuel-Navarrete & Pelling (2015) and O’Brien (2012)), one in which the volunteers are taking ownership of the garden and making decisions as a cohesive unit, also known as “collective efficacy”, or collective agency (Teig, et al., 2009). Despite the theme of transformation present across the history of community gardening in the US (Pudup, 2008), scholars have argued that actions of “citizenship practice,” such as participating in community gardens, are not inherently transformative or empowering (Ghose & Pettygrove, 2014). Therefore, the goal of this research is to understand and support the current transformational momentum in the ECG volunteer community by testing the potential leveraging effects of a sustainability intervention, a t-lab, and its effect on the human factor of the ECG SES.

Transformation of SES are characterized by diversity and uncertainty in the pathways that change can take (Leach, Scoones, & Stirling, 2007; Fazey, et al., 2015). Some pathways are desirable, leading to a sustainable and thriving garden community, but undesirable pathways are always possible, including transformation back to the garden’s original state of vacant land. There are, of course, many other potential pathways that the garden can and probably will take during its lifetime, and it is important to realize that many pathways of change are interconnected and happening simultaneously at different scales within a given system (Fazey, et al., 2015). But for the current actors within the ECG system, there is a clear desire to take a pathway that leads to a stronger, more cohesive state in the social-ecological system, as evidenced by the time, effort, money, and other personal and professional resources dedicated so far and the degree of collective efficacy shown by core volunteers (Scott, 2003). High levels of volunteer engagement (e.g. spending time at the garden and with other volunteers, planning and attending garden activities, and “taking action” in the garden) improve supportive social connections and strengthen social norms, which leads to greater collective efficacy in community gardens (Teig, et al., 2009). If the goal is to see community gardens thrive, we need to look at community gardens as SESs that rely on not only having material resources and organizational oversight, but a human component that relies on personal, voluntary commitment to the success of the garden and to collective efficacy in the volunteer community. Taking the lens of the SES allows us to look at all three facets of successful community gardens under one framework, to explore their interactions and focus on developing the necessary human and social capital without losing sight of the other important aspects that make up the garden (Manuel-Navarrete & Pelling, 2015).

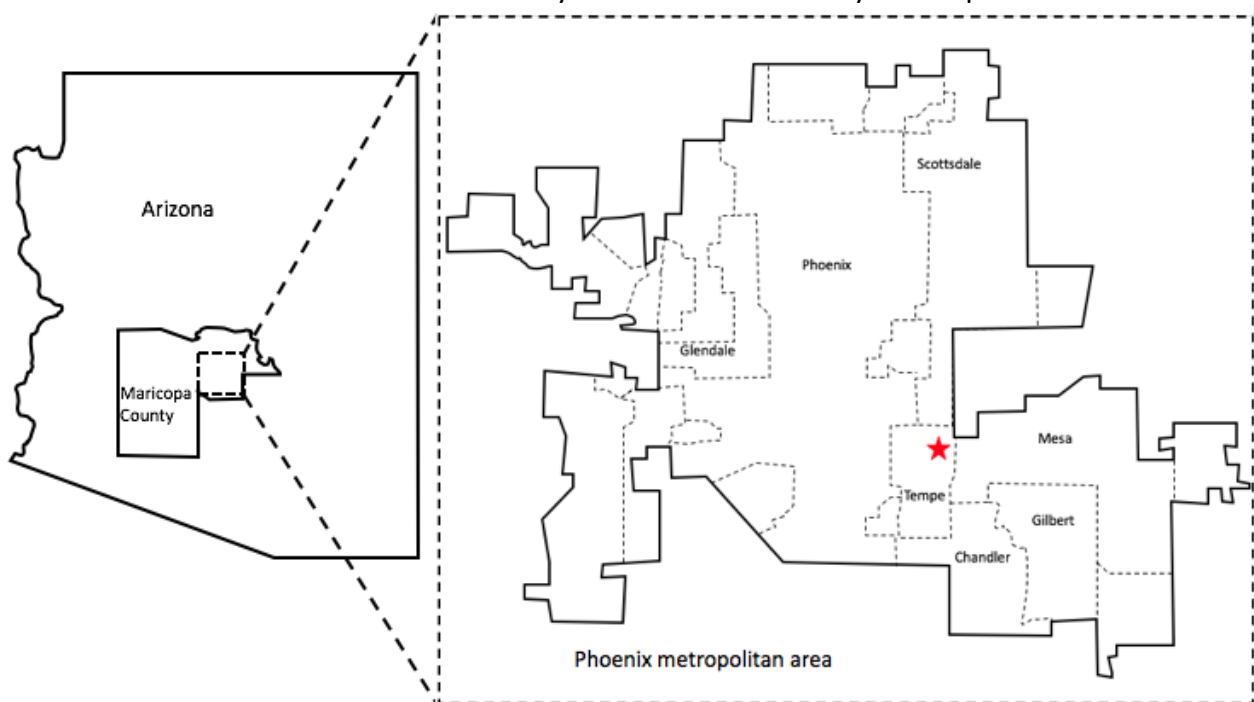
## Benefits of Community Gardens in the US

Community gardens have been popular in the US since the 19<sup>th</sup> Century, fluctuating in times of war and economic crisis, but never disappearing. Even today, according to the American Community Gardening Association (ACGA), there are an estimated 18,000 community gardens in the US and Canada (American Community Gardening Association, n.d.). The United States Department of Agriculture (USDA) has a lot of information on urban farming and farmer's markets, but very little information on community garden prevalence, operations, and success. A 2014 study by the National Gardening Association is one of the more accessible and recent sources of community garden statistics available. According to this study, 35% of all US households (which equates to about 42 million people) participated in food gardening in 2013, whether in private gardens or community gardens, 21% of all food gardening households in 2013, about 9 million people, lived in urban areas, and millions of new people participate in community gardens each year, following a continuous upward trend (The National Gardening Association, 2014).

Research has described many benefits of participating in community gardens. For youth, garden programs provide opportunities for “constructive activities, contributions to the community, relationship and interpersonal skill development, informal social control, exploring cognitive and behavioral competence, and improved nutrition” (Ober Allen, Alaimo, Elam, & Perry, 2008, p. 419). Urban community gardens allow for, particularly among low-income populations, increased consumption of fruits and vegetables, which leads to better nutrition in both children and adults (Dibsdall, Lambert, Bobbin, & Frewer, 2002), as well as increased physical and mental health from having access to outdoor green space (Van Den Berg & Custers, 2011; Wakefield, Yeudall, Taron, Reynolds, & Skinner, 2007). They increase community cohesion and the development of social capital (which can foster positive social processes like mutual trust and reciprocity), which not only can have mental health benefits for low-income communities but also can lead to other issues in the neighborhood being addressed due to increased community organizing (Armstrong, 2000; Draper & Freedman, 2010; Glover, 2004; Liamputtong & Sanchez, 2017; Teig, et al., 2009). Urban green spaces like gardens can be particularly important for older, more industrial cities and those with large amounts of vacant land, such as the Phoenix metropolitan area, because they beautify areas, increase property values, build a sense of community among neighbors, abate criminal activity in or near vacant lots, and prevent trash accumulation, illegal dumping, and littering (Schukoske, 2000). This is not to mention the numerous ecological benefits of having urban gardens, such as more equitable and consistent delivery of ecosystem services, increased biodiversity, improved biogeochemical flows, healthier pollinator populations, reduced transportation-related pollution and costs, and the role they can play in climate change mitigation (Knizhnik, 2012; Okvat & Zautra, 2011).

## Community Gardens in the Phoenix Valley, AZ

Figure 2. Map of Arizona showing Maricopa County and Phoenix Metropolitan Area. Red star denotes location of the Escalante Community Garden within the city of Tempe.



Interest in community gardening has become more prevalent for the Phoenix metropolitan area over the past two decades. Much of the farmland in Maricopa County has been lost in recent years due to suburban and commercial development on the fringes of the city (Musacchio, Crewe, Steiner, & Schmidt, 2003; Redman & Kinzig, 2008). The Phoenix metro region is particularly known for its high rates of vacant land; 43 percent of land in Phoenix was reported as vacant in 2000, with more recent reports putting the percentage even higher (Pagano & Bowman, 2000; Reagor, 2016). Chronic issues with land vacancy and the recognition of food deserts has led to dozens of urban gardening projects throughout the Valley, often spearheaded by nonprofit organizations, like Tiger Mountain Foundation and the International Rescue Committee, and cities, such as the PHX Renews in Phoenix and the City of Mesa Community Garden Initiative.

Despite obvious interest in these gardens by various organizations, cities, and residents, actual community member involvement in the gardens continues to be sporadic and low overall (Bleasdale T. , 2015, p. 175). Gardens in the Phoenix metro area often experience a high turnover of both community gardeners and leaders/organizers, which can lead to garden failure and abandonment (Bleasdale, Crouch, & Harlan, 2011). According to researchers who've studied urban gardens in Phoenix, the main reason why community gardens have not succeeded in the past is that organizers have failed to align their programs and the mission of the gardens with the needs and desires of the community (Bleasdale, Crouch, & Harlan, 2011).

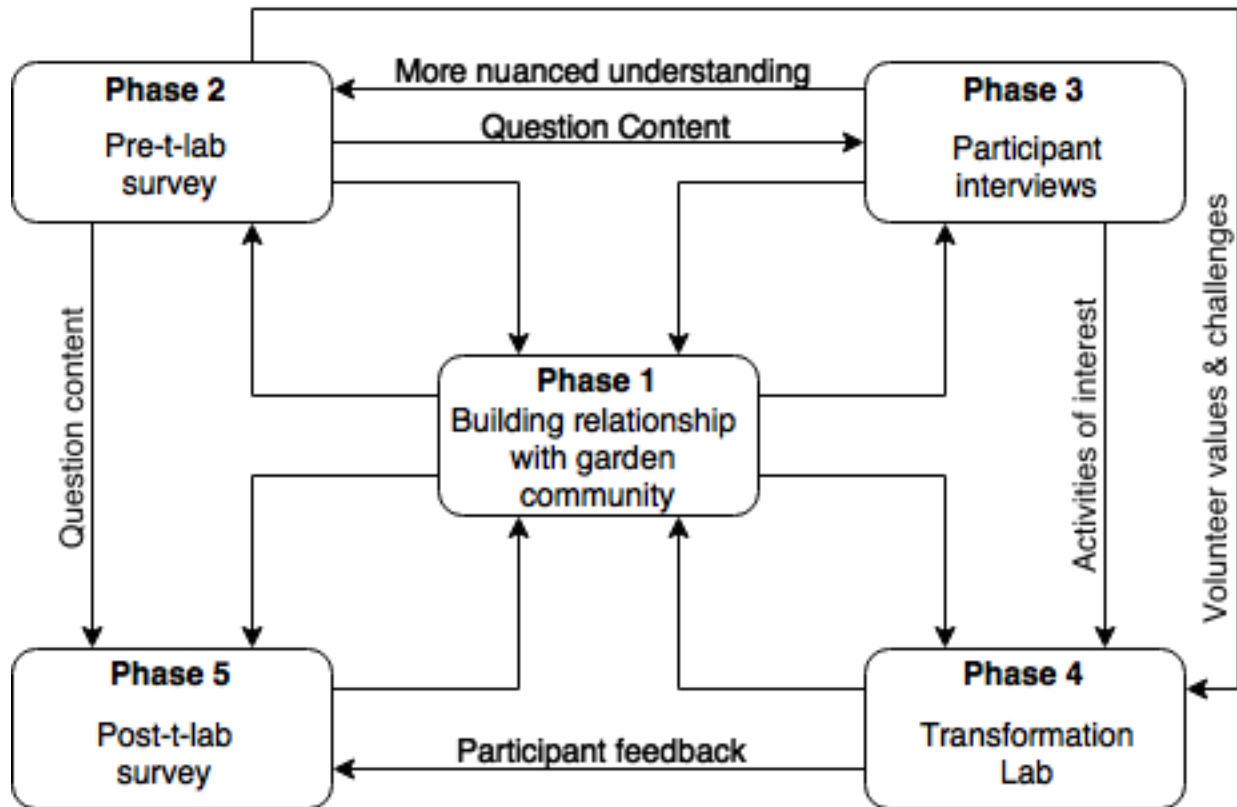
Another reason community gardens fail is due to a sort of tragedy-of-the-commons mentality or lack of a commons culture where unclear rules cause that the garden gets harvested by many people, while the difficult tasks and responsibilities fall to a precious few dedicated, over time often resentful, community members (Charles, 2012).

Regardless of the perceived burdens of gardening and very low community involvement rates in most current community gardens in the Valley, there are indications that residents want community gardens in their neighborhoods (Bleasdale, Crouch, & Harlan, 2011). Not only do residents value community and other local gardens for the perceived superior quality of the produce, but also for the “therapy” and personal growth, community building, connection to morally “good” principles such as hard work and manual labor, intergenerational cultural transmission, and education (Bleasdale T., 2015). Residents in Tempe have identified community gardens as important to meeting the sustainability goals of the city (City of Tempe, Arizona, 2016). There are about fifty-six active community gardens registered in Maricopa County, with about twenty-five registered gardens classified as either inactive or “status unknown” (City of Phoenix, 2016). Some community gardens may not want their information publicized, and so may or may not chose to be listed on a registry.

I examined several potential case studies of community gardens in the Phoenix metropolitan area for this research. I ultimately chose Escalante Community garden because it was clear to me after several site visits that the garden had an active volunteer community, organizational support from TCAA, and abundant material resources, but that the volunteer community was interested in growing their numbers and collective efficacy to support long term success of the garden. ECG is unique in that it doesn’t have a paid staff member from TCAA that works in the garden, while at the same time adhering to a completely communal garden model (both features that set it apart from other community gardens in the area). The garden was also conveniently located close to my home, and the volunteer community was open and enthusiastic toward my involvement as a researcher.

## Methods & Research Design

Figure 3. Research phases interactions and knowledge flows



Research methods ultimately included five phases: (1) building rapport with the garden community through participant observation, (2) surveying volunteers, (3) conducting interviews to triangulate survey results, (4) conducting the t-lab, and (5) administering a post t-lab survey (Figure 3). The first phase started in 2016, and lasted 18 months. I became a community garden volunteer and member of the Escalante Community Garden Council (“the council”), during which time I was gradually given more garden maintenance responsibilities. Data collection included journaling, self-reflection, and informal, unstructured “interviews” with volunteers (Ortlipp, 2008; Kawulich, 2005; Dearnley, 2005). I selected these methods to identify patterns among volunteers at the garden, and to document my own journey as a ECG volunteer. I coded all written notes and journal entries from this phase using methods from *The Coding Manual for Qualitative Researchers* to inform future phases (Saldaña, 2015). Codes were translated into eight categories that influenced the survey questions on values in phase II, and include: (1) Connection to other people/community, (2) Connection to nature, (3) Teaching/learning/new knowledge/new ways of knowing, (4) Food, (5) Spirituality, (6) Personal feelings/obligation to self, (7) Administrative responsibility/obligation to others, and (8) Physical Health.

In phase 2, I conducted a survey of community garden volunteers, with a goal of answering three specific questions: (1) Are there “core” and a “peripheral” volunteer groups?; (2) Are the people in the periphery valuing the garden in the same ways as the core?; and (3) If the periphery volunteers do value the garden, what is keeping them from being more

committed? Data and contact information about volunteers was obtained from the TCAA volunteer database (Shipka, personal communication, 2017). I developed the survey based on phase 1 observations and previous studies on community gardens (Draper & Freedman, 2010; Scheromm, 2015). The survey aimed for volunteers to identify: (1) whether they belonged in the core or periphery volunteer group with respect to their level of commitment to the physical garden space and the social garden community, (2) values and motivations associated with participating at ECG, and (3) challenges to being more committed to the garden. I administered the 17-question survey over the course of one month through two means: (1) Qualtrics, an online survey tool available to ASU students, and (2) printed copies that I left in the garden. Because copies of the survey were left unattended in the garden for one month, I am not sure how many people encountered the survey, so I don't have accurate distribution numbers.

The literature is not very specific regarding how to measure community garden participation levels (Booth, Chapman, Ohmer, & Wei, 2017); it varies from study to study. For my case study, I defined volunteer commitment as both the amount of time volunteers spent working in the garden, and number of responsibilities volunteers have at the garden as self-identified by each volunteer. These criteria were chosen based on observations I made during phase 1 of the differentiating factors between core and peripheral volunteers in ECG. Based on my observations, I established that volunteering less than once per week in any capacity denotes peripheral volunteer status at the ECG. I hypothesized that volunteers who were at the garden more often (i.e. core volunteers) would have more responsibilities on average than peripheral volunteers. Higher levels of participation in general in individual community gardeners are associated with higher levels of well-being and community empowerment, with regular garden participants experiencing a greater sense of community and organizational empowerment (Booth, Chapman, Ohmer, & Wei, 2017). Therefore, it is important to encourage an increase in commitment of ECG gardeners who self-identify as peripheral volunteers to build social capital within the garden community.

I also differentiated between values that reflected how participants "feel" when at the garden ("associated values") and benefits that participants enjoy or appreciate through their volunteerism at the garden ("positive aspects/benefits") (Table 1). These two values categories reflect different ways of conceptualizing volunteer motivations for gardening as observed during phase 1 conversations with ECG volunteers. Values chosen for inclusion in the survey were also influenced by studies done on community gardener motivations (Clayton, 2007; Draper & Freedman, 2010; Scheromm, 2015). Despite significant overlap, I included both values categories in the survey with the goal of increasing the likelihood that values from one category or the other might resonate more with some participants based on wording (wording on surveys can have major effects on participant response, as evidenced in Rasinski (1989)). I measured associated values through a Likert scale (Boone Jr. & Boone, 2012). Studies show that the inclusion of a neutral option in opinion questions significantly increases the number of

people falsely stating that they have no opinion, so I did not include a “no opinion” option in any of the survey’s opinion questions (Bishop, 1987; Johns, 2005; Kalton, Roberts, & Holt, 1980; Krosnick et al., 2002; Nowlis, Kahn, & Dhar, 2002). I measured positive aspects/benefits through a simple list selection.

Table 1. Two different ways of conceptualizing values of the community garden volunteers.

<b>Associated values</b>	<b>Positive aspects/benefits</b>
Happy and/or content	Spending time outside/ in a natural setting.
Connected with nature	Spending time in the garden is a calming or spiritual experience.
Like I’m part of a community	The act of gardening / doing physical labor.
Like a better citizen	Getting free produce.
More autonomous	Spending time with other volunteers.
More sustainable	Making friends / getting to know my neighbors.
More spiritually connected	Feeling like I’m part of a community of like-minded people.
Closer to my home, family, or ancestors	Teaching others.
Like my life has meaning or purpose	Facilitating connections between other volunteers and community members.
Hopeful	Getting to put my knowledge and/or skills to use.
	Feeling useful, needed, and/or important.
	I get a feeling of personal accomplishment when I work in the garden.
	Feeling healthy.
	Spending my time in a productive way.
	Learning about gardening.
	Other

Challenges to volunteering are universal across most sectors of the volunteer industry, including nonprofits and community gardens. An important aspect to volunteer recruitment and retention includes knowing the “Who (characteristics of volunteers)”, “What (definition)”, “Where (context)”, and “Why (motivation)” (or, in this case, “why not”) of their volunteer population (Bussell & Forbes, 2002). The challenges that informed the survey administered in ECG were identified from both the literature and information gathered in the participant observation phase (Table 2).

Table 2. Challenges to spending more time in the garden as presented in the survey.

<b>Challenges to participating in the garden</b>
I don’t have enough time
I don’t know enough people there.

My family and/or friends don't go there.
The garden is not high on my priority list.
I would rather be doing something else.
Work or school.
I don't know what I'm doing when I'm at the garden.
I don't feel welcome there.
The garden doesn't grow the food that I like.
I don't feel like I understand the other volunteers.
Other

I conducted seven semi-structured, qualitative interviews with survey participants for phase 3. The goal was to uncover reasons *why* some people in the volunteer community were more active and built more social relationships in the garden than others. Four of the interviewees were peripheral volunteers; three were core volunteers. Phases 1 and 2 results informed interview questions, as did a community garden case study that also used qualitative interviews (Liamputtong & Sanchez, 2017). I modified the eight original codes from phase 1 to reflect the four different ways people interact with, and in, community garden spaces: intellectually, emotionally, physically, and spiritually (Kingsley, Townsend, & Henderson-Wilson, Cultivating health and wellbeing: members' perceptions of the health benefits of a Port Melbourne community garden, 2009). I created additional codes for time/convenience/money (labeled as “other”) and interviewee-identified personal challenges. I also noted when interviewees spoke negatively about the garden (based on language and tone). Guiding interview questions can be seen in Table 3.

Table 3. Questions used to guide semi-structured interviews in phase 3.

<p><b>General questions (all participants)</b></p>	<ul style="list-style-type: none"> <li>● How did you start getting involved in the garden?</li> <li>● How has your involvement changed over time?</li> <li>● What does your participation in the garden mean for you?</li> <li>● What is your main motivation to participate in the garden?</li> <li>● What initially drew you in and made you want to be a part of the garden?</li> <li>● In a perfect world, what would volunteering at the garden look like for you and how could that be accomplished?</li> <li>● What do you think are the biggest challenges that prevent people from volunteering more at the garden?</li> </ul>
<p><b>Core volunteer specific questions</b></p>	<ul style="list-style-type: none"> <li>● What are some examples of activities in the garden you have participated in that have especially moved you or made you want to deepen your participation in the garden?</li> </ul>

<b>Peripheral volunteer specific questions</b>	<ul style="list-style-type: none"> <li>• If your challenges to volunteering were removed, would this mean you would volunteer more at the garden? What are some ways those challenges could be removed?</li> <li>• Is there anything that you or anyone else could do that might help you feel more connected to the garden and/or other volunteers?</li> </ul>
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Phase 4 consisted of designing, organizing, and implementing a four-hour T-lab in the Escalante Community Center in the evening of February 6, 2018. The hypothesis of the T-lab was that it would facilitate movement from the periphery volunteer group to the core volunteer group (ultimately increasing the number of core volunteers) by strengthening the bonds between peripheral and core group members through arts-based activities focused on place-based values. I based the t-lab design partially on examples from the STEPS Centre, which identifies “three core principles” that “are essential to a t-lab: the challenge being addressed by the group must be complex and preferably social-ecological in nature, the convened group should be diverse (how diverse is a still up for debate), and there should be an action-oriented outcome to the process that leaves participants energised to drive change” (STEPS Centre, 2016). Participants were invited to attend through word-of-mouth and email correspondence. To encourage attendance, I provided free food and childcare to all participants during the duration of the t-lab. I developed and conducted t-lab activities based on results from phases 2 and 3, as well as volunteer feedback. The workshop was broken up into four one-hour activities. Activities were structured around the four interaction types: physical, intellectual, spiritual, emotional, and content was based on volunteer interest (gathered during phase 3) and feasibility. Participants were encouraged to attend one or more activities based on their interest level and time allowance. Activities included building a bench (physical), making a fall planting calendar (intellectual), mindful seed planting and vegetable eating (spiritual), and a group improvisational performance (emotional) (Table 4). These types of arts-based community building exercises are commonly used in sustainability settings (Heras & Tabara, 2014; Richardson, 2016; Dieleman, 2008). They build trust, organizational capacity, and social capital among participants, spur participants to further collective action, and increase sense of community (Skippington & Davis, 2016). Each activity consisted of five minutes of activity and participant introductions, forty minutes of doing the activity, and ended with fifteen minutes of a facilitated talking circle (Winters, n.d.). After the talking circle, participants were also provided with one or two “Keep it going!” assignments, designed to give participants ideas on how to stay in engaged with the garden following the activities. Another researcher and I observed t-lab activities, taking notes on general participation, willingness to engage, and observable changes in participants throughout the process. I coded t-Lab results in accordance with the modified qualitative codes established in phase 3.

Table 4. Summary of t-lab activities.

Activity order	Name of activity	Interaction type	Description of activity	Materials used	"Keep it going!" assignment
1	Bench building	Physical	Volunteers were expected to read and interpret printed instructions as a team to assemble, secure, and stain a bench intended for outdoor use. Pre-planning included picking the bench design, buying materials, and pre-cutting the wood.	<ul style="list-style-type: none"> <li>• Wood (pre-cut to specified dimensions)</li> <li>• Screws</li> <li>• Power drills</li> <li>• Instructions with written and visual directions</li> <li>• Measuring tape and carpentry pencil</li> <li>• Water sealer/outdoor wood stain, brushes, &amp; tarp</li> <li>• Protective masks and glasses</li> </ul>	Come back on the following volunteer work day to finish the bench project. Brainstorm bench placement in the garden.
2	Making a fall planting calendar	Intellectual	Volunteers had to pick 1 or 2 plants of their choice (from a predetermined list of potential fall garden crops), research the growth preferences of their chosen plant, and choose a location in the garden for planting. They were encouraged to think about the activity from the plant's point of view.	<ul style="list-style-type: none"> <li>• Reference books on planting in the desert</li> <li>• Printed materials from the Maricopa County Master Gardeners extension service</li> <li>• Computers and cell phones with access to the internet for research purposes</li> <li>• Large laminated map of the garden with markers</li> <li>• Several smaller maps of the garden with writing utensils</li> </ul>	Come back the following week to participate in finalizing the fall planting calendar. Think about any plants you might like to see in the garden that weren't included on the list provided for the activity.
3	Mindful seed planting/mindful eating	Spiritual	Volunteers were led in a series of mindfulness exercises, including planting a seed in a pot of dirt, watching a video of the plant growing from seed to fruit, and eating the fruit, with a mind toward embracing the energy and emotions of all the living organisms that the plant may encounter during its lifetime from garden to digestion.	<ul style="list-style-type: none"> <li>• 5-minute video showing the entire lifecycle of a pepper plant from germination to fruit ripening</li> <li>• Script on being mindful during the planting and eating activities</li> <li>• Dirt, small flower pots, and pepper seeds</li> <li>• Whole pepper (for observation)</li> <li>• Chopped pepper with seeds and stem removed (for eating)</li> </ul>	Take your pepper plant home, try to grow it and be mindful of the experience of growing the plant in the same way we were in the activity. If people so desire, once the seeds sprout and grow a few inches they can bring their seedlings to the garden to plant them.
4	Group improv performance	Emotional	Clearing an open space in the middle of the room, volunteers were told to choose one of two roles to play: gardener/human or a "character" in the garden (sun, soil, tool, plant, etc.). The gardener would enter the garden and present a problem or a challenge. Then the garden characters would give wisdom or support to the gardener from the point of view of their character. Volunteers were asked to see things through their characters' eyes without passing judgement, offering advice, or answering from their own perspective.	<ul style="list-style-type: none"> <li>• No materials required besides participants themselves</li> </ul>	Connect with the people in your improv group at least once over the next month, whether that be at the next garden work day, in the garden other than the work day, or outside of the garden completely.

Phase 5 consisted of re-administering the survey one month after the conclusion of the t-lab, with the goal to measure any changes in participants' commitment to the garden, as well as their values. I included additional questions in this survey to allow participants to provide feedback on the t-lab experience and associated activities. I administered the survey via Qualtrics to all t-lab participants and garden volunteers. I also distributed printed copies of the survey to volunteers present at the garden on one volunteer day, and left surveys at the garden

to be collected a week later. I obtained an updated list of volunteer contact information from the TCAA and ECG volunteer databases (McKenzie, personal communication, 2018).

All survey, interview, and t-lab participants read participation information statements and signed consent forms during each phase of the research. All activities, written materials, and consent documents were approved the ASU Institutional Review Board (IRB) human subjects assessment.

## Results & Discussion

T-labs are similar to an experiment, but much less controlled and not exclusively designed for data collection, confirmation of hypotheses, or generation of knowledge propositions. T-labs are necessarily adaptive and co-produced, relying heavily on the reciprocal relationship between participants (e.g., garden volunteers) and researchers. The results presented and discussed in this section rely on qualitative and quantitative data from observation, surveys and interviews collected to document personal and collective changes that occurred in the volunteer population throughout the 5-phase process, particularly those that can be reasonably attributed to the t-lab. Results are presented as they address each of the research questions.

### Identifying and Understanding the “Core” and “Periphery”

During phase 1, I noticed a distinction between the council members and “other” volunteers, based on several observations: (1) that council members were taking on more responsibilities and spent more time in the garden, indicating a higher level of personal commitment to the garden than the other volunteers, and (2), that the council members communicated effectively and worked as a team (“the council”) to achieve goals (such as completing garden projects, ordering supplies, and applying for grants), while other volunteers may have been active participants but shifted in and out of, or never took on, leadership roles in the garden. I came to call these two groups “core” and “peripheral” volunteers, respectively, and this became the basis for my study and informed my research questions.

Phase 2 survey received 56 total responses: 47 online and 9 paper. After accounting for unusable responses, 46 total responses were left for analysis. Demographic information was also gathered during the survey. Survey results indicated that the instruments was useful to distinguish between core and peripheral groups in the garden volunteer community based on level of commitment to the garden. 34 respondents (73.91%) identified as peripheral volunteers based on time spent in the garden; those respondents also indicated that they held a total of 54 garden responsibilities, an average of 1.6 responsibilities per volunteer. The 12 respondents (26.09%) who identified as core volunteers indicated that they held a total of 62 garden responsibilities, an average of 5.2 responsibilities per volunteer. This data suggests that people who spend more time at the garden also take on more responsibilities, supporting the

hypothesis that there are core and peripheral volunteer groups present in the garden volunteer community. 14 peripheral respondents indicated that they wanted to volunteer at the garden more often than they already were, with 9 peripheral respondents indicating they would like to volunteer as frequently as core volunteers. No core volunteers indicated that they wanted to volunteer less frequently than they already were. The difference in level of responsibility between the two groups was also not due to lack of interest on the part of peripheral volunteers, with a total of 102 responses representing responsibilities they were *willing* to take on in the garden in the future, an average of 3 responsibilities per volunteer, almost double the amount they currently had. Core volunteers answered with 59 (avg. 4.9 per volunteer) total responsibilities they were willing to take on in the future.

During phase 3 qualitative interviews, I asked interviewees to reflect on why they are involved in the garden, how their involvement has changed over time, and what we could do to help them or others feel more committed to the garden. Core volunteers were more frequently talked about emotional, intellectual, and spiritual connections to the garden, while peripheral volunteers more frequently talked about time, money, and convenience as related to their volunteerism, as well as personal challenges that kept them from participating more often. Both groups were equally as likely to talk about the physical space or physical aspects of the garden (such as performing manual labor, the barrier represented by the fence, harvesting or eating the produce, etc.). Core volunteers were more likely to speak negatively about the garden, whether that be the physical space, volunteer community, or the volunteers' relationship with TCAA.

### The Transformation Lab as a Catalyst for Social Movement

The research process of a t-lab resembles the action research cycle of planning, implementing, observing, and reflecting using small, practicable, inclusive, and reiterative steps (University of Warwick Learning and Development Centre (LDC), 2012). Therefore, analysis of the t-lab included reflecting on planning and implementation of the activities, using observations from the t-lab to code patterns in the types of language participants used and how they interacted during each activity.

During the planning phase of the t-lab, I worked closely with volunteers (both core and peripheral) to plan activities and purchase supplies. Volunteers were supportive of the workshop from the beginning, offering their services to help me prepare for the activities. I made it clear to volunteers from the beginning of the planning process that the goal was building a sustained and successful volunteer community. A total of 12 garden volunteers (5 core and 7 peripheral) attended the t-lab. I analyzed the effectiveness of each of the four activities using observational data collected during the t-lab and phase 5 survey responses. Before beginning the T-lab, I asked the student researcher who was observing to look for different types of verbal and nonverbal cues (also called "immediacy behaviors") that showed

evidence of strong interpersonal ties between participants (Rovai, 2000; Swan & Shea, 2005). Examples of verbal cues include giving praise, soliciting viewpoints, humor, and self-disclosure, while examples of nonverbal cues include physical proximity, touch, eye-contact, facial expressions, and gestures (Swan & Shea, 2005). I believe all four of the activities were successful in engaging volunteers; participants were outspoken throughout the t-lab—and in post-t-lab survey feedback questions—about the positive aspects of the activities, commenting several times specifically on the bonds the activities created among them. Volunteers appeared to grow closer to each other as the t-lab progressed; participants that stayed for multiple (three or more) activities appeared to be much closer to the other volunteers than those who only took part in one activity.

Volunteer connection was observed through expression of many immediacy behaviors, including sharing knowledge and learning, active listening, sharing personal stories, verbal expressions of appreciation, giving praise, smiling, laughing, touching hands during activities that required tool sharing, and hugging. Volunteers who took part in the final activity seemed the most intimately connected as compared to participants in other activities. I believe this was due in part to the specifics of the final activity, the group improvisational performance. Because participants were playing characters, and specifically encouraged to access their emotional connections to the garden and to each other, they could experiment with different types of behavior and take themselves less seriously than participants in the first two activities, which focused on achieving a goal. This resulted in increased vulnerability and many more examples of emotional expression (including several expressions of “love” among participants) than the previous activities. If the t-lab had started with this activity, instead of leaving it for last, perhaps examples of this emotional connection would have persisted throughout the other activities as well.

There were no incidents or specific points during the t-lab in which participants were observed growing apart or expressing negativity towards each other or the activities. Two times, once during the mindfulness activity and once during the group improvisation activity, a participant set themselves apart from the others or refused to participate in some aspect. Observations from these activities showed that in both these instances, the volunteers continued to be engaged in what other participants were doing, while respectfully setting boundaries for their own comfort. As facilitator, I encouraged participants who withdrew from activities to consider joining us, but didn't push the matter if they refused.

The most difficult activity to coordinate was the bench building activity, simply because I have no prior experience with carpentry, and it required much more work leading up to the t-lab than expected. It was also the first activity of the t-lab, so it took a while to settle into my concurrent roles of facilitator—keeping the activity running smoothly and encouraging dialogue between volunteers—and of participant. This activity was also the most technically difficult, which meant greater frustration amongst participants who were forced to work together to

interpret the bench building instructions, earning it the most criticism from participants in the post-t-lab survey. It was generally considered by respondents to have gotten off to a slow start, compounded by the frustration of having “confusing” instructions and working in a group setting where most participants did not have experience with building. I was not expecting the level of disappointment that participants felt in not completing the project during the allotted time, but I was able to invite them back to complete the project on the following volunteer work day. The bench was eventually completed with the help of garden volunteers.

The mindfulness activity had the most participants, but it also lasted the least amount of time of all the activities, ending well before the intended time. It also had a rough start as we experienced technical difficulties and some of the participants had brought children who were loud and distracting during the first few minutes of the activity. Unfortunately, the parents left the activity early, as they were unable to calm their children down. Because there were many participants, and a good mix of peripheral and core volunteers, we filled the extra time at the end of the activity with a robust talking circle and allowed time for participants to eat dinner and chat amongst themselves; many introductions were made between volunteers who had not previously met. The only point of criticism this activity received during the post-t-lab survey was that it didn’t leave participants with tools to practice mindfulness on their own. The planting calendar activity was criticized as being “chaotic”, which I believe was beneficial as it forced participants to figure out how to effectively communicate with each other to create something useful for the garden. The completion of the activity brought the volunteers closer in that it “allowed everyone to be on the same page” and it created a “needed tool”. Lastly, the group improvisational activity received no negative feedback.

Several points of criticism that the t-lab activities received could actually have been strengths when it came to building connections between participants. The bench building activity received the most negative feedback of the four activities, but it also provided some of the most meaningful experiences for participants. It brought volunteers to work together in ways that were described as “useful”, “empowering”, “a reminder of accomplishment”, and fostered a “great sense of community”. It also had the most visible lasting impacts for the volunteers, as it attracted many volunteers who had not participated in the t-lab to help complete the project during subsequent garden work days, and it was the only activity that was explicitly mentioned to have been talked about among volunteers after the completion of the t-lab.

There were 20 total responses to the post-t-lab survey (phase 5): 20 online responses and no paper responses. After accounting for unusable responses, 14 total responses were left for analysis. Of the ten (71.43%) respondents that identified as peripheral volunteers, four remained in the periphery from the pre-t-lab survey, one switched from core to periphery, and five are unknown. The one volunteer that moved from core to periphery was previously a very strong core volunteer but had to leave the country for work frequently over the past few

months of the study, prompting him to answer as a periphery volunteer in the post-t-lab survey. Outliers like this, which in the short term can skew data, could be accounted for with a longer-term study. Of the four (28.57%) respondents that identified as core volunteers, all previously identified as core volunteers. These findings show no shift from the peripheral volunteer group to the core volunteer group after the conclusion of the t-lab. The findings could be skewed by a lack of time between the conclusion of the t-lab and the administration of the post-survey. One month is most likely not enough time to witness a long-term social change, especially when the shift from periphery to core relies heavily on volunteers being able to make time in their schedules to increase volunteer time and the number of responsibilities held at the garden. There may not have been enough time to allow for participants to show reprioritization. There were also only two volunteer work days that took place in the interim between the t-lab and the post-survey. While three t-lab participants did say that they shared their experiences in the t-lab with other volunteers after the conclusion of the t-lab, more time may have presented the opportunity for participants to share their experiences and encourage other volunteers—or even people who had never volunteered at the garden before—to engage in new or different ways with the garden and/or the volunteer community. Without further study, the effects of more time on the potential long term impacts of the t-lab in building social capital and facilitating social movement are impossible to determine.

Regardless of the evidence of higher levels of social capital in the ECG volunteer community post-t-lab, there wasn't any evidence that supported the hypothesis that changed values or increased social capital would facilitate movement from periphery to core. This could be explained by the failure of the labels "core" and "periphery" to accurately describe the volunteer community in the ECG volunteer community. While I believed they would be useful constructs for the purposes of this research, these static labels fail to capture the dynamism of the garden volunteer community, or of the human factor in any SES. In future research, it may be useful to define labels that more accurately reflect the range of volunteer commitment and diversity of social roles played in the garden SES.

There are also other reasons besides values that volunteers may not experience periphery to core movement. While peripheral volunteers did identify challenges around not feeling a strong sense of community ("I don't know enough people there" & "My family and/or friends don't go there") and a lack of knowledge ("I don't know what I'm doing when I'm at the garden"), the major challenges (with four to five times the response rate of other challenges) centered around time and convenience ("I don't have enough time", "Work or school", "The garden is not high on my priority list", and write-in answers regarding distance from home, traveling on weekends, and having small children). Lack of time and inconvenience were cited as the most difficult challenges for both core and peripheral volunteers.

Age and sociocultural profile of the community gardener can affect volunteer commitment as well (Scheromm, 2015). Information collected during the survey showed

interesting demographic differences between core and peripheral volunteers (see Table 5 for a summary). Based on these findings, peripheral volunteers were mainly young, white women who live further from the garden than most core volunteers. No trends were visible in their income levels or the number of hours they worked per week. The core volunteer group was much more diverse, with a mix of ages, genders, and ethnicities, who mostly live close or very close to the garden. Core volunteers are mostly lower income people who work full time outside of the garden. These results might be explained by two things: one, that many of the volunteers who come for volunteer days once per month are from Arizona State University, which shows student demographics as being mostly white and about half women (women are also more likely than men to volunteer) (United States Department of Labor, 2016; Arizona State University, 2017); and two, that the neighborhood directly surrounding the ECG is very demographically diverse (United States Census Bureau, 2013), so if most core volunteers live near the garden, it follows that they would be representative of the community. Another factor that could affect volunteer availability but was not addressed in this study was the presence of children and/or a spouse. Because core volunteers work more hours per week on average than peripheral volunteers, and because both groups identified lack of time and inconvenience as the major limiting factors for spending more time at the garden, I believe that despite peripheral volunteer perceptions that these challenges keep them from being able to volunteer as much as core volunteers, this is probably false.

Table 5. Summary of demographic profile of ECG volunteers.

	Age	Gender	Race/Ethnicity	Distance traveled to garden	Hours worked per week	Annual Household Income
<b>General</b>	Even distribution	60% more women than men or other	Mostly white	65% live near the garden	Even distribution	Visible trend from lower income to higher income
<b>Core</b>	Mostly 36 or older	Even distribution	Mostly white & Latinx with a more even distribution of other ethnicities	80% live near the garden	Mostly fulltime (40+ hours/week)	Mostly lower income
<b>Periphery</b>	Mostly 35 or younger	50% more women than men or other	Mostly white	50% live near the garden	Even distribution	Even distribution

### Value Trends Among Core and Peripheral Volunteers

Pre-t-lab survey responses (phase 2) around values indicated that, overall, core and periphery volunteers held similar values when it came to the garden. Statistical analysis of differences in values between the two groups was run through a "N-1" chi-squared test

(MedCalc Software, Ostend, Belgium) as recommended by Campbell (2007) and Richardson (2011), and a similar test was used in another community garden study (Booth, Chapman, Ohmer, & Wei, 2017). Using the statistical analysis, only the value of “spending time in the garden is a calming or spiritual experience” was significantly different between the two groups, with a P value of 0.0496. Other differences—determined by at least a 10 percent difference or higher between response rates of the two groups—were still useful in comparing values between core and peripheral volunteers for the purposes of developing the t-lab. Notable trends in the associated values included core volunteers feeling “hopeful” and like they are “part of a community” more often than peripheral volunteers (Figure 5 and Figure 6). In valuing the positive aspects/benefits of the garden, core volunteers valued spirituality, “spending time with other volunteers”, “teaching others”, and “facilitating connections between other volunteers and community members” more, while periphery volunteers valued “feeling healthy” and productivity more (Figure 7).

Figure 5. Percentage of core volunteer survey respondents with associated values.

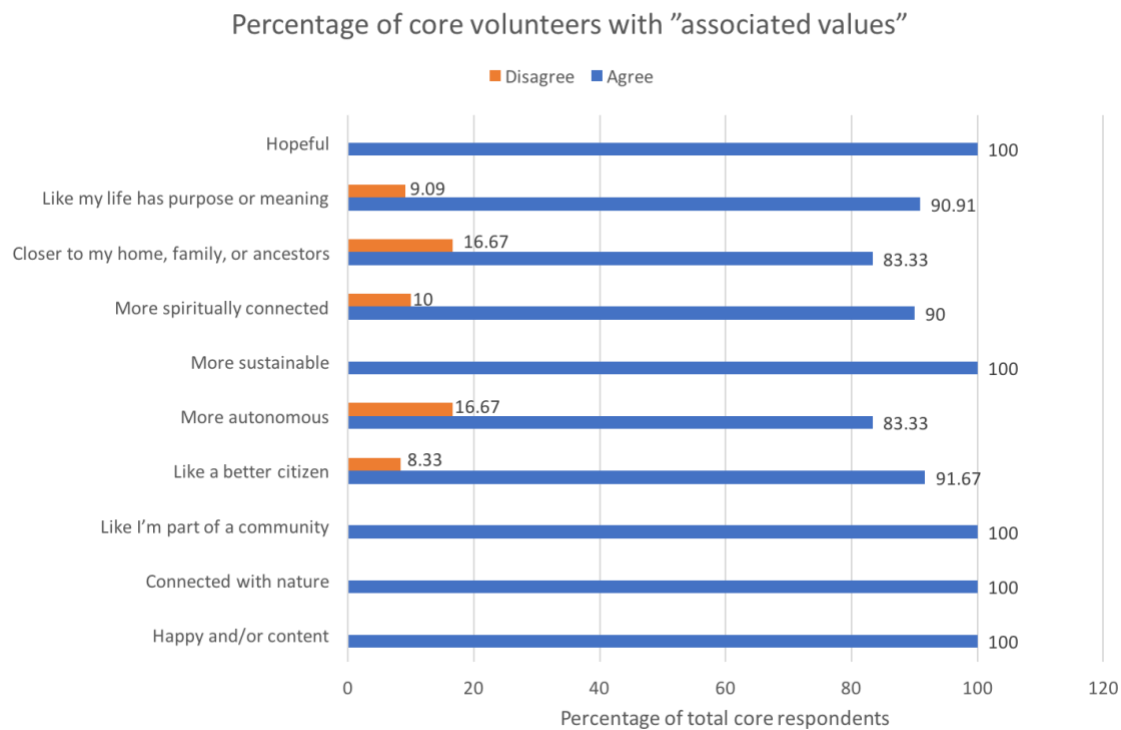


Figure 6. Percentage of peripheral volunteer survey respondents with associated values.

### Percentage of peripheral volunteers with "associated values"

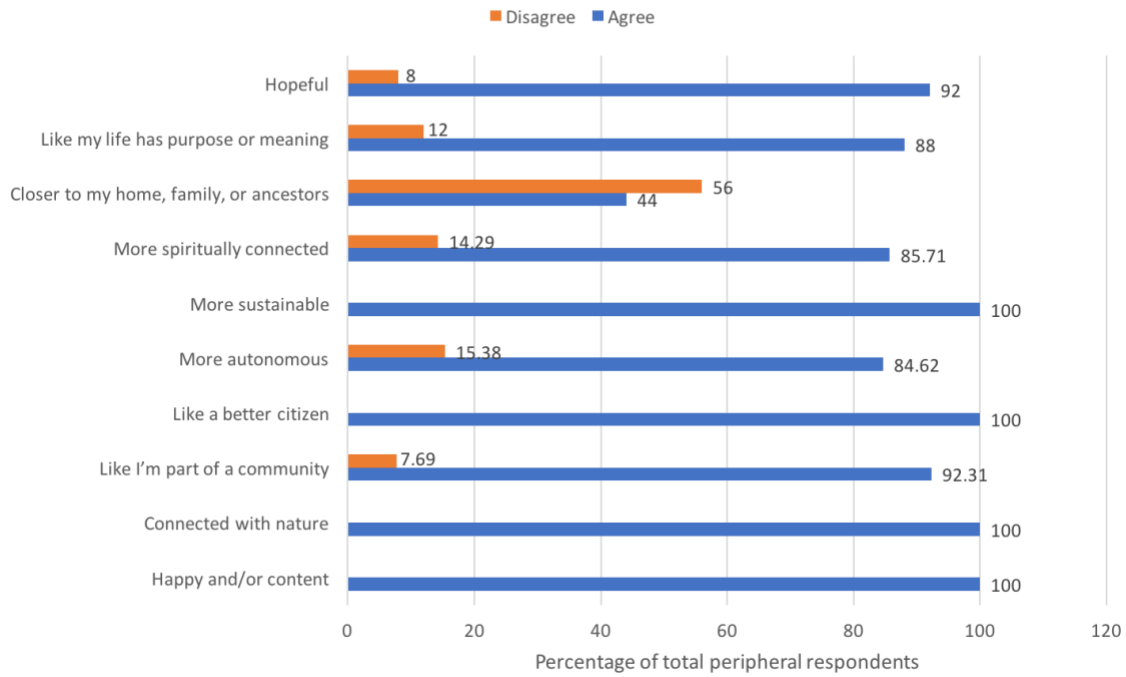
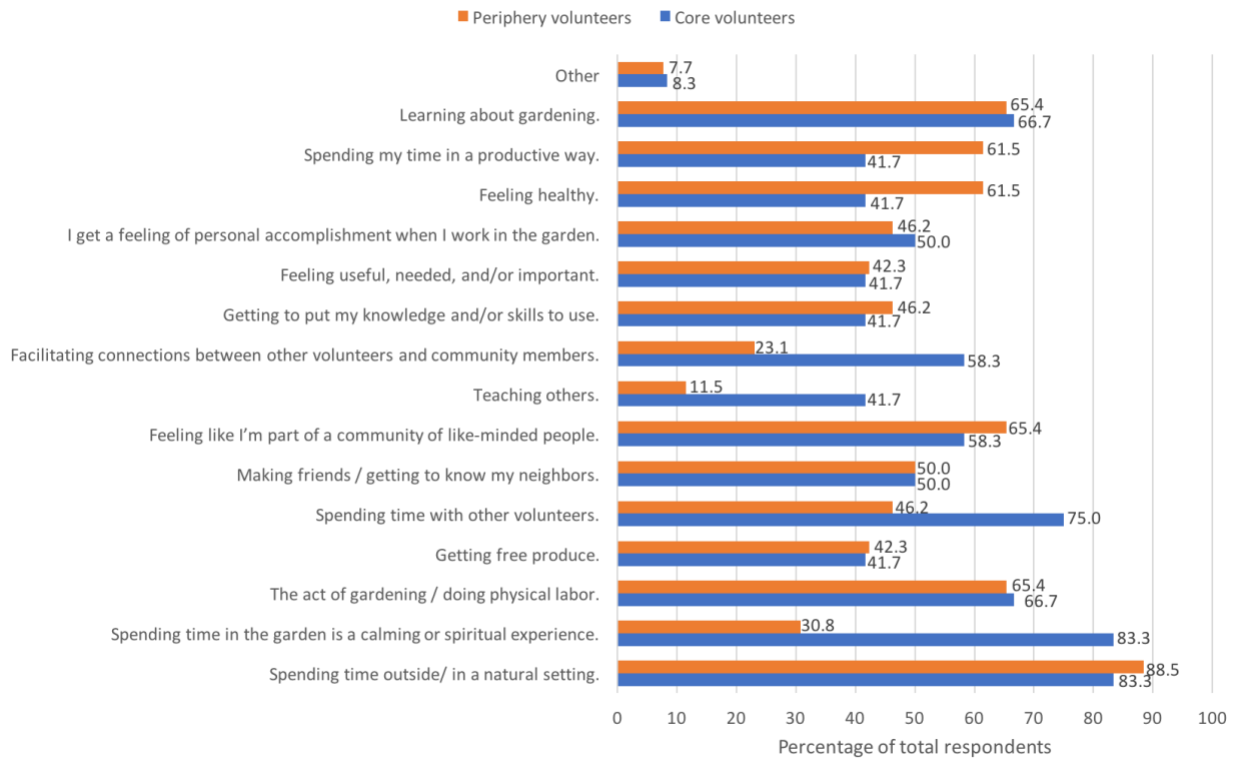


Figure 7. Percentages of each group who value "positive aspects/benefits" of the garden.

### Percentage of respondents who value "positive aspects/benefits" of the garden



## The Transformation Lab as a Catalyst for Value Change

With such a small sample size in the post-t-lab survey, and with only about half of the survey respondents having attended the t-lab, it is hard to say if there was any definitive change in the way volunteers valued the garden after participating in the t-lab. All findings regarding values identified in the post-t-lab survey should be viewed as anecdotal, reflecting the feelings of only a small percentage of the overall volunteer population. Nevertheless, the survey revealed some interesting trends. In associated values, core volunteers answered more positively overall than they did on the pre-t-lab survey, with increases in the percentage of respondents who said they felt “like a better citizen”, “more autonomous”, “more spiritually connected”, “closer to my home, family, or ancestors”, and “like my life has purpose or meaning”. Peripheral volunteers, in comparison to their pre-t-lab survey answers, continued to feel “happy/content”, “connected with nature”, “like a better citizen”, and “more sustainable”, but decreased in the amount that they felt “more autonomous”, “more spiritually connected”, and “like my life has purpose or meaning”.

In valuing positive aspects/benefits of the garden, there were also noticeable differences in both groups from the pre-t-lab survey. Core volunteers continued to value spirituality, “spending time with other volunteers”, and “facilitating connections between volunteers” more than peripheral volunteers, with the addition of values such as “making friends/getting to know my neighbors” and “feeling like I’m part of a community of like-minded people”. In comparison with their pre-t-lab survey responses, core volunteers increased in the amount they valued “feeling healthy” and “spending my time in a productive way” by almost 50 percent, but saw a decrease in the amount they valued “teaching others”. Peripheral volunteers, on the other hand, saw much different shifts as compared to their pre-t-lab survey responses, with an overall decrease in the amount they valued “spending time outside” and “feeling like I’m part of a community of like-minded people”, but an increase in the amount they valued “teaching others”.

The most encouraging thing to note from this data is the overall increase in positive emotions and values that core volunteers felt toward the garden after the t-lab. The only negative shift in values from the core volunteers was in the value of “teaching others” (accompanied by the increase in peripheral volunteers valuing “teaching others”) which could be a sign that the peripheral and core volunteers are beginning to see each other on more equal terms, and less in a teacher/student or leader/follower relationship. Many volunteers, both core and peripheral, pointed out they felt this dynamic during pre-t-lab interviews, so seeing a shift toward more reciprocity and collaboration between volunteers is extremely encouraging.

Another interesting finding is that before the t-lab, peripheral volunteers valued health and productivity more than core volunteers, but after the t-lab, these values became equally as

important to both volunteer groups. I think this illustrates an important aspect of social transformation and intervention research: that building social capital and all its elements (trust, reciprocity, etc.) requires the active participation of and affects everyone involved. Even though the “goal” of the t-lab was to facilitate movement of ECG volunteers from the periphery to the core, the more important outcome turned out to be knowledge sharing and value sharing across the two groups. When I had been planning the t-lab, if I had not included activities that addressed values important to the peripheral group as well as the core, or vice versa, there would not have been as active engagement from both groups, and therefore not as much emotional vulnerability and openness to change.

## Conclusions & Directions for Future Research

Despite the lack of illustrative data from the post-t-lab survey showing social movement from periphery to core in the ECG volunteer community, there is much evidence that supports the conclusion that the transformation lab was successful in fostering self-reflection and collective agency among garden volunteers, developing and strengthening the garden’s human factor. From before to after the t-lab, volunteers from both groups began to view core and peripheral volunteers on more equal terms in the garden social community, erasing the constructs of “leader” and “follower” that had previously defined and divided them. Volunteers who participated in the t-lab reacted overwhelmingly positively in feedback about the overall experience and individual activities, and survey results demonstrated an increase in overall positivity towards the garden community (specifically from core volunteers). Both the presence of verbal and nonverbal cues recorded during the duration of the t-lab indicated that volunteers felt more closely bonded and emotionally invested in the volunteer community after participating in the t-lab. Results also indicated that volunteers were more willing to work together to problem-solve and achieve common goals. Criticism of the t-lab revealed what was important to volunteers (e.g. the knowledge and use of applicable skills) and revealed volunteer needs (e.g. structure and clearly-defined expectations), which can now be used to improve the overall volunteer experience in future garden projects.

Another important finding was the relationship between volunteer commitment to the garden and the types of volunteer engagement. Peripheral volunteers overall were more interested in engaging in the garden in ways that they felt wouldn’t interfere with other priorities, such as school and work, while core volunteers were much more interested in forms of engagement that facilitated emotional and spiritual connections to the garden. Lack of time, while an important *perceived* barrier among peripheral volunteers, was shown to be a non-reason for lower commitment levels. This finding, along with the evidence that peripheral volunteers actually want to be more committed in the garden (both in time and level of responsibility), justifies the need for more opportunities for volunteer engagement consistent with the t-lab activities, as well as the tools and knowledge to get peripheral volunteers

engaged in these ways. The t-lab activities were successful in involving participants in the physical, intellectual, emotional, and spiritual aspects of the garden, but were not successful in the ways needed to facilitate movement from periphery to core. This failure could be due to the isolated nature of the intervention—a series of t-labs over a longer period of time may have been more successful—or the structural and demographic barriers that peripheral volunteers face. In this case, it appears a single t-lab intervention could not provide enough of a push to overcome even minor barriers by those peripheral volunteers who were willing and able.

While I asked participants about the challenges they faced that kept them from being more committed to the garden, no part of the t-lab design focused on addressing or overcoming practical challenges to volunteering. A potential area of future research could be altering the t-lab design to include open discussion on the challenges faced by all volunteers, showing that peripheral volunteers are not alone in their experiences of major challenges. T-lab activities could focus on ways to overcome said challenges, exposing new and creative ways to participate in the garden community and cultivate personal commitment. Rather than focusing solely on building social capital through shared values, overcoming challenges collectively could be a very effective way to build social capital among volunteers, initiating social movement from periphery to core.

The most important lesson I learned was that the design and implementation of a t-lab must be done within the context of a specific community, and must involve the community as much as possible if you want it to be even remotely successful. I was fortunate in that I had the time and opportunity to embed myself in the ECG volunteer community and form many sustained and successful relationships with the volunteers. These relationships and my very involvement with the community as a researcher and volunteer sparked changes beyond just those of the t-lab. Delving into research on the importance of the human factor to the success of the ECG SES highlighted the role of strength of bonds between volunteers within and among various stakeholder groups in the garden (core volunteers, peripheral volunteers, and TCAA liaisons). While these bonds existed long before I came, now they are more in the forefront of volunteers' minds, particularly those in the council, and can be further examined and manipulated to benefit the garden.

While the implementation and results of this research are extremely specific to the Escalante Community Garden, tools and methods from this study could be used to initiate or supplement deliberate social transformation in other contexts, especially in other community gardens. While research around deliberate transformation in social-ecological systems is rare, the tools to understand and create such transformation can be found in bodies of academic literature around social learning, organizational theory, complex adaptive systems, pathways approaches, transformation, community development, volunteer retention, and community arts, among others. Examples of adaptable tools used in this study are the framework for

analyzing social-ecological systems, art-based community building exercises, and survey and interview structures.

Demand for societally impactful intervention research is growing, particularly in the field of sustainability (Sannino & Engestrom, 2017). For community gardens, systems-level transformation can mean the difference between a thriving community built on trust and reciprocity—with the potential for feeding people, improving physical and mental health, and providing valuable ecosystem services to the surrounding city—and nonexistence. T-lab interventions have the potential to act as a catalyst and guide for transformation in gardens across the US, with the context-specific, people-oriented, place-based approach that allows solutions to be organic and long-lasting. It is clear that a longer-term study would need to be done to show a positive shift in volunteer commitment to the Escalante Community Garden over time due to increased social capital created during a transformation lab or series of transformation labs. There was, however, evidence of increased social capital in the ECG, not only after the t-lab intervention, but over the full course of my eighteen-month involvement at ECG. This garden, like many others across the US and the world, has a volunteer community currently undergoing a transformative social change. Without the relationships I built at ECG in the months leading up to the intervention, I do not believe the t-lab could have been successful. Now, I believe ECG volunteers have the knowledge and means to continue the work of deliberate social transformation beyond my involvement, continuing to expand the human factor of the ECG SES, supporting the longevity of the garden, and allowing the garden community to thrive.

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